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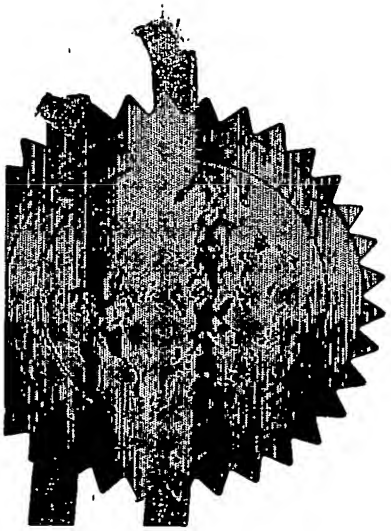

Signed

Dated 8 January 2004

GB 0228028.7

By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of

FORD GLOBAL TECHNOLOGIES LLC,
Suite 600 Parklane Towers East,
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United States of America

Incorporated in USA - Delaware,

[ADP No. 08600959001]

Patents Form 1/77

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Patents Act 1977
(Rule 16)

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P01/7700 0.00-0228028.7

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Request for grant of a patent

1. Your reference	202-0853GB/RMF
2. Patent application number	0228028.7 30 NOV 2002
3. Full name, address and postcode of the or of each applicant.	Ford Global Technologies, Inc. Suite 600, Parklane Towers East One Parklane Boulevard, Dearborn Michigan 48126-2490 USA
Patents ADP number	7230113
If the applicant is a corporate body, give the country/state of its incorporation	Michigan, United States of America
4. Title of the invention	**An Adjustable Hinge Assembly**
5. Name of your agent	R M Farrow et al
"Address for service" in the United Kingdom to which all correspondence should be sent.	Land Rover Patent Department 53W5/12 Warwick Technology Park Warwick CV34 6RG
Patents ADP Number	80190360003

SECTION 30(1) 1977 ACT) APPLICATION FILED 7/7/03

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and the or each application number.	Country	Priority application number	Date of filing

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing

8. Is a statement of inventorship and of right to grant of a patent required in support of this request.	YES

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Continuation sheets of this form	
Description	12
Claim(s)	5
Abstract	1
Drawing(s)	2 + 2

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Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	1+1
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature

Date
27 November 2002

R M Farrow

R M Farrow Agent

12. Name and daytime telephone number of person to contact in the United Kingdom. R M Farrow 01926 482150

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DUPLICATE

PATENT APPLICATION - DATASHEET / INFORMAL FRONT SHEET

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Applicants Ref: 202-0853GB/RMF

Title: AN ADJUSTABLE HINGE ASSEMBLY

Priority:

Country: GB United Kingdom

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Please notify the above contact if any of the above details are incorrect or inconsistent with the application forms.

REPORT COMPLETED

An adjustable hinge assembly

This invention relates to hinges and in particular to an adjustable hinge for pivotally securing a closure or door of a motor vehicle to part of the body structure of the motor vehicle.

It is well know to hingedly connect the doors or tailgate of a motor vehicle to the body structure by means of two or more hinges. Traditionally these hinges have one plane of adjustment between the hinge and the body structure and one plane of adjustment between the hinge and the door or closure. Because the hinge is normally attached to the closure first and then to the body structure, there is only one plane of adjustment unless the already tightened fixings are released and then re-tightened. This release and re-tightening process often introduces errors in the positioning of the closure and is also time consuming and disruptive in a production line environment.

It is an object of this invention to provide an improved hinge assembly.

According to a first aspect of the invention there is provided a hinge assembly for pivotally connecting a closure member to a support structure, the hinge assembly comprising at least two pivotally connected hinge members interposed between the closure member and the support structure and an adjustment mechanism for adjusting the position of the closure member relative to the support structure, wherein the adjustment mechanism is operable to adjust the position of the closure member relative to the support structure in three dimensions.

Advantageously, the hinge assembly may comprise a first hinge member for fastening to one of the closure member and the support structure, a second hinge member for fastening to the other of the support structure and the closure member, a pivot means to pivotally connect the first and second hinge members together for relative rotation about a pivot axis, an adjustment nut threadingly engaged with a thread formed on an external

surface of the second hinge member and having a shank for engagement with a clearance aperture in the component to which the second hinge member is attached and a locking bolt engageable with a threaded bore formed in the second hinge member to hold the second hinge member in an adjusted position.

Adjustment of the hinge assembly along an adjustment axis arranged normal to the pivot axis so as to alter the distance between the pivot axis and the component to which the second hinge member is attached is made by adjusting the position of the adjustment nut on the second hinge member.

The first member may be fastened to the closure member and the second hinge member may be fastened to the support structure. In which case, adjustment of the hinge assembly along an adjustment axis arranged normal to the pivot axis so as to alter the distance between the pivot axis and the support structure may be made by adjusting the position of the adjustment nut on the second hinge member.

Alternatively, the second member may be fastened to the support structure and the second hinge may be fastened to the closure member. In which case, adjustment of the hinge assembly along an adjustment axis arranged normal to the pivot axis so as to alter the distance between the pivot axis and the closure member may be made by adjusting the position of the adjustment nut on the second hinge member.

Adjustment of the hinge assembly in a plane arranged normal to the adjustment axis may be made by adjusting the position of the shank of the adjustment nut within the clearance aperture.

The support structure may comprise two spaced apart flanges defining a cavity therebetween, the adjustment nut being positioned so as to react against one of the flanges and the locking bolt being arranged so as to react against the other of the two flanges.

A tubular spacer may be positioned in the cavity to transfer a clamping force from the locking bolt to the adjustment nut.

A washer may be interposed between a head of the locking bolt and the flange against which it reacts.

In a first embodiment of the first aspect of the invention, the threadform on the outer surface of the second hinge member is of the opposite hand to the threadform in the threaded bore, in which case the outer surface of the second hinge member may have a left handed threadform thereon for co-operation with a complimentary left-handed thread formed in the adjustment nut and the threaded bore may have a right-handed threadform therein for cooperation with a right-handed thread formed on the locking bolt.

The shank of the nut may have a bore through which the lock bolt extends in use and the bore may include one or more drive means used to provide a driveable connection between the locking bolt and the adjustment nut.

Preferably, the driveable connection may be operable to allow the adjustment nut to be rotated relative to the second hinge member during adjustment until a pre-determined torque is reached and then may be operable to allow the locking bolt to rotate relative to the shank of the adjustment nut to allow the locking bolt to secure the second hinge member in its adjusted position.

The drive means may comprise one or more detents which engage with an outer surface of the locking bolt.

In a second embodiment of the first aspect of the invention, the shank of the adjustment nut is provided with a drive means used to facilitate rotation of the adjustment nut during adjustment of the hinge assembly, in which case the shank of the adjustment nut may have a bore in which is formed the drive means.

The drive means may be a hexagonal shaped portion of the bore in the shank of the adjustment nut.

The closure member may be one of a door for a motor vehicle, a bonnet for a motor vehicle, a boot lid for a motor vehicle, a fuel filler cap cover for a motor vehicle and a tailgate for a motor vehicle and the support structure may be a body structure of a motor vehicle.

According to a second aspect of the invention there is provided a motor vehicle having at least one hinge assembly in accordance with said first aspect of the invention.

According to a third aspect of the invention there is provided a method of attaching a closure member to a body structure of a motor vehicle the method comprising pivotally connecting a first hinge member to a second hinge member, fastening the first hinge member to the closure member, threadingly engaging an adjustment nut onto the second hinge member so as to position the nut away from a free end of the second hinge member, engaging a shank of the adjustment nut in a pre-formed clearance aperture, moving the closure member into a desired position corresponding to the correct position of the closure member relative to the body structure, holding the closure member in the desired position, rotating the adjustment nut so as to cause it to engage with part of the body structure, tightening a locking bolt threadingly engaged with the second hinge member so as to clamp the second hinge member to the body structure and releasing the closure member so as to allow it to rotate freely with respect to the body structure.

Preferably, the closure member is held in the desired position by an assembly fixture to which it is releasably attached.

The step of moving the closure member into a desired position may include locating the shank of the adjustment nut in a specific location within the clearance aperture.

The adjustment nut may be rotated by means of a drive means formed as an integral part thereof until a pre-determined tightening torque is reached.

Advantageously, the adjustment nut and the locking bolt are provided with opposite handed threadforms and rotating the adjustment nut so as to cause it to engage with part of the body structure may be performed automatically as the locking bolt is tightened.

The invention will now be described by way of example with reference to the accompanying drawing of which:-

Fig.1 is a cross-section through part of a motor vehicle showing a hinge assembly according to a first embodiment of the invention;

Fig.2 is a pictorial representation of a hinge assembly according to a second embodiment of the invention;

Fig.3 is a pictorial view in the direction of arrow X on Fig.2; and

Fig.4 is a pictorial view of a double hinge.

With particular reference to Fig.1 there is shown a preferred embodiment of the invention as fitted to a motor vehicle 10. The motor vehicle 10 has a support structure in the form of a body structure 11 and a closure member such as a door or tailgate 12 is hingedly attached to the body structure 11 by means of an adjustable hinge assembly.

The hinge assembly comprises a first hinge member 13 for fastening to the tailgate 12, a second hinge member 15 for fastening to the body structure 11, a pivot means in the form of a pivot pin 22 to pivotally connect the first and second hinge members 13 and 15 together for relative rotation about a pivot axis and an adjustment nut 16 threadingly engaged with a thread formed on an external surface of the second hinge member 15. The adjustment nut 16 has a shank 20 for engagement with a clearance aperture 23 in the body structure 11 and a bore 26 through which a locking bolt 18 extends for engagement with a

threaded bore formed in the second hinge member 15 to hold the second hinge member 15 in an adjusted position.

The body structure 11 has two spaced apart flanges 11a, 11b defining a cavity 11c therebetween. A tubular spacer 17 is positioned in the cavity 11c to transfer a clamping force from the locking bolt 18 to the adjustment nut 16 when the hinge assembly is secured in position. A washer 19 is interposed between a head 18h of the locking bolt 18 and the flange 11b against which it reacts to distribute the force applied thereto.

When adjusted and secured in place the adjustment nut 16 is positioned so as to react against the first one 11a of the flanges 11a, 11b and the locking bolt 18 is arranged so as to react against the other 11b of the two flanges 11a, 11b.

The adjustment nut 16 has a flange 25, the shank 20 and a hexagonal head 21. The bore 26 of the adjustment nut 16 has one or more drive means in the form of detents 27 formed therein. The detents 27 are used to provide a driveable connection between the locking bolt 18 and the adjustment nut 16.

Preferably, the driveable connection between the detents 27 and the locking bolt 18 is sufficient to allow the adjustment nut 16 to be rotated relative to the second hinge member 15 during adjustment until a pre-determined torque is reached and then allows the locking bolt 18 to rotate relative to the shank 20 of the adjustment nut 20 to permit the locking bolt 18 to be tightened and secure the second hinge member 15 in its adjusted position.

The threadform on the outer surface of the second hinge member 15 is of the opposite hand to the threadform in the threaded bore of the second hinge member. In the embodiment shown the outer surface of the second hinge member 15 has a left handed threadform thereon for co-operation with a complimentary left-handed thread formed in the adjustment nut 16 and the threaded bore of the second hinge member 15 has a right-

handed threadform therein for cooperation with a right-handed thread formed on the locking bolt 18.

The hinge assembly is able to provide three dimensional adjustment relative to the body structure 11. Firstly the hinge assembly can be adjusted along an adjustment axis arranged normal to the pivot axis so as to alter the distance between the pivot axis and the body structure by adjusting the position of the adjustment nut 16 on the second hinge member 15.

Adjustment of the hinge assembly in two further directions lying on a plane arranged normal to the adjustment axis can be made by adjusting the position of the shank 20 of the adjustment nut 16 within the clearance aperture 23. That is to say if adjustment along the adjustment axis provides up and down adjustment then adjustment on the plane provides forward and backward and left and right adjustment.

Setting of the hinge assembly is as follows. Firstly the first and second hinge members 13 and 15 are manufactured then the first hinge member 13 is pivotally connected to the second hinge member 15 by inserting the pivot pin 22 into respective apertures in the first and second hinge members 13 and 15. The next step is to fasten the first hinge member 13 to the tailgate 12 using a fastener 14. The adjustment nut 16 is then threadingly engaged with the thread formed on the outer surface of the second hinge member 15 so as to position the adjustment nut as far away from a free end of the second hinge member 15 as is possible. This will provide the maximum amount of free play between the adjustment nut 16 and the first flange 11a. The next step is then to engage the shank 20 of the adjustment nut 16 in the pre-formed clearance aperture 23, the spacer 17 having already been placed in position during fabrication of the body structure 11.

The next step is to move the tailgate 12 into a desired position corresponding to the correct position of the tailgate 12 relative to the body structure 11. To do this an assembly

fixture (not shown) is used to which the tailgate 12 is releasably secured. The assembly fixture may be in the form of a robot having clamping means used to grasp the tailgate and hold the tailgate in the desired position.

In this position the hinge assembly is adjusted to ensure that when the assembly fixture is released the tailgate 12 will be in the correct position relative to the body structure 11. This is done by rotating the adjustment nut 16 until it engages with the first flange 11a forming part of the body structure 11. Because the threadforms used on the adjustment nut 16 and the locking bolt 18 are of opposite hands the locking bolt 18 can be rotated in a clockwise tightening direction to automatically adjust the adjustment nut 16 into engagement with the first flange 11a and set the first adjustment. When a pre-determined torque has been reached further rotation of the adjustment nut 16 will not occur because the locking bolt 18 will start to slip over the detents 27.

Further rotation of the locking bolt 18 will then cause the locking bolt 18, which is threadingly engaged with the second hinge member 15, to clamp the second hinge member 15 to the body structure 11 by bringing the head 18h of the locking bolt 18 into contact with the washer 19 and urging the washer against the second flange 11b. After the locking bolt 18 has been tightened to the required torque then the tailgate 12 is released from the assembly fixture so as to allow it to rotate freely with respect to the body structure 11.

It will be appreciated that because the assembly fixture holds the tailgate 12 in the desired position then when the shank 20 of the adjustment nut 16 is located in the clearance aperture 23 it is located in a specific location within the clearance aperture 23 corresponding to the correct forward/rearward and left/right positions so that adjustment in these directions is automatically adjusted upon assembly. If minor adjustments are required to the hinge assembly during the service life of the vehicle 10 then the hexagonal head 21 of the adjustment nut 16 can be used to rotate the adjustment nut 16.

It will be appreciated that two hinge assemblies are used to hingedly connect the tailgate to the body structure 11 and that during assembly the tailgate is held in the desired position while both of the hinge assemblies are adjusted before releasing the tailgate 12. Thus a hinge assembly constructed in accordance with this invention provides a hinge assembly that is able to provide adjustment in three dimensions in a simple and cost effective manner.

Referring now to Figs. 2 and 3 there is shown a second embodiment of a hinge assembly that is directly replaceable for the hinge assembly previously described with reference to Fig.1. The hinge assembly comprises a first hinge member 113 for fastening to the tailgate 12, a second hinge member 115 for fastening to the body structure 11, a pivot means in the form of a pivot pin 122 to pivotally connect the first and second hinge members 113 and 115 together for relative rotation about a pivot axis and an adjustment nut 30 threadingly engaged with a thread formed on an external surface of the second hinge member 115.

The adjustment nut 30 has a shank 31 for engagement with a clearance aperture in the body structure 11 and bore through which a locking bolt (not shown) extends for engagement with a threaded bore formed in the second hinge member 115 to hold the second hinge member 115 in an adjusted position.

As before, the body structure comprises two spaced apart flanges 11a, 11b defining a cavity 11c therebetween. A tubular spacer is positioned in the cavity 11c to transfer a clamping force from the locking bolt to the adjustment nut 30 when the hinge assembly is secured in position. A washer is interposed between a head of the locking bolt and the flange 11b against which it reacts to distribute the force applied thereto. The adjustment nut 30 has a flange 29, the shank 31 and a hexagonal head 33.

The bore of the shank 31 has a drive means formed therein used to facilitate rotation of the adjustment nut 30 during adjustment of the hinge assembly. The drive means is in the form of a hexagonal shaped portion 35 of the bore in the shank 31 of the adjustment nut 30 into which a hexagonal shaped drive means can be inserted to facilitate rotation of the adjustment nut 30. It will be appreciated that other drive means could be provided and that the invention is not limited to the use of a hexagonal drive means. The first hinge member 113 has two apertures 34 formed therein each of which is used to accommodate a fastener (not shown) used to attach the first hinge member 113 to the tailgate 12.

As before, the hinge assembly is able to provide three dimensional adjustment relative to the body structure. Firstly the hinge assembly can be adjusted along an adjustment axis arranged normal to the pivot axis so as to alter the distance between the pivot axis and the body structure by adjusting the position of the adjustment nut 30 on the second hinge member 115.

Adjustment of the hinge assembly in two further directions lying on a plane arranged normal to the adjustment axis can be made by adjusting the position of the shank 31 of the adjustment nut 30 within the clearance aperture in the body structure.

Setting of the hinge assembly is as follows, firstly the first and second hinge members 113 and 115 are manufactured then the first hinge member 113 is pivotally connected to the second hinge member 115 by inserting the pivot pin 122 into respective apertures in the first and second hinge members 113 and 115.

The next step is to fasten the first hinge member 113 to the tailgate 12 using two fasteners which are engaged with the apertures 34. The adjustment nut 30 is then threadingly engaged with the thread formed on the outer surface of the second hinge member 115 so as to position the adjustment nut 30 as far away from a free end of the second hinge member 115 as is possible.

The next step is to engage the shank 31 of the adjustment nut 30 in the pre-formed clearance aperture in the body structure. To do this the tailgate 12 is moved into a desired position corresponding to the correct position of the tailgate 12 relative to the body structure 11. An assembly fixture (not shown) is used to facilitate this positioning and the tailgate 12 is releasably secured to the assembly fixture. As before, the assembly fixture may be in the form of a robot having clamping means used to grasp the tailgate and hold the tailgate in the desired position.

In this desired position the hinge assembly is adjusted to ensure that when the assembly fixture is released the tailgate 12 will be in the correct position relative to the body structure 11. This is done by inserting a hexagonal shaped driver into the hexagonal drive means 35 and rotating the adjustment nut 30 until it engages with the first flange 11a forming part of the body structure 11. The adjustment nut 30 is rotated until a pre-determined torque has been reached. The hexagonal shaped driver is then removed and the locking bolt is inserted into the bore in the shank 31 of the adjustment nut 30 and is threadingly engaged with second hinge member 115. The locking bolt is then rotated to clamp the second hinge member 115 to the body structure 11 by bring the head of the locking bolt into contact with the washer and urging the washer against the second flange 11b.

After the locking bolt has been tightened to the required torque then the tailgate 12 is released from the assembly fixture so as to allow it to rotate freely with respect to the body structure 11. As before two hinge assemblies are fitted to the tailgate and these are both adjusted at the same time while the tailgate is held in position by the assembly fixture.

If minor adjustments are required to the hinge assembly during the service life of the vehicle 10 then the hexagonal head 33 of the adjustment nut 30 can be used to rotate the adjustment nut 30.

The primary difference between the first and second embodiments is that in the first or preferred embodiment the locking bolt automatically adjusts the position of the adjustment nut whereas in the second embodiment a separate tool is required to perform this function.

Although the invention has been described with specific reference to a top hinged tailgate it will be appreciated that it is equally applicable to the fixing of doors and other closures on both motor vehicle and other structures requiring accurate setting of the closure relative to the support structure. It will be further appreciated that the second hinge member can be fastened to either the support structure or the closure member depending upon the situation with a corresponding fastening of the first hinge member to the closure member or to the support structure. It will yet further be appreciated that the first hinge member could be in the form of a double hinge, as shown in Fig.4 in which two fixed leaves are joined to form one leaf.

It will also be appreciated that the invention is equally applicable to combination or multi-link hinges having several hinge members interposed between the closure member and the support structure.

It will yet further be appreciated by those skilled in the art that the invention has been described by way of example with reference to specific embodiments but that various modifications or alternative embodiments could be made without departing from the scope of the invention.

CLAIMS

1. A hinge assembly for pivotally connecting a closure member to a support structure, the hinge assembly comprising at least two pivotally connected hinge members interposed between the closure member and the support structure and an adjustment mechanism for adjusting the position of the closure member relative to the support structure, wherein the adjustment mechanism is operable to adjust the position of the closure member relative to the support structure in three dimensions.

2. A hinge assembly as claimed in claim 1 wherein the hinge assembly comprises a first hinge member for fastening to one of the closure member and the support structure, a second hinge member for fastening to the other of the support structure and the closure member, a pivot means to pivotally connect the first and second hinge members together for relative rotation about a pivot axis, an adjustment nut threadingly engaged with a thread formed on an external surface of the second hinge member and having a shank for engagement with a clearance aperture in the component to which the second hinge member is attached and a locking bolt engageable with a threaded bore formed in the second hinge member to hold the second hinge member in an adjusted position.

3. A hinge assembly as claimed in claim 2 in which adjustment of the hinge assembly along an adjustment axis arranged normal to the pivot axis so as to alter the distance between the pivot axis and the component to which the second hinge member is attached is made by adjusting the position of the adjustment nut on the second hinge member.

4. A hinge assembly as claimed in claim 3 in which adjustment of the hinge assembly in a plane arranged normal to the adjustment axis is made by adjusting the position of the shank of the adjustment nut within the clearance aperture.

5. A hinge assembly as claimed in any of claims 2 to 4 in which the support structure comprises two spaced apart flanges defining a cavity therebetween, the adjustment nut being positioned so as to react against one of the flanges and the locking bolt being arranged so as to react against the other of the two flanges.

6. A hinge assembly as claimed in claim 5 in which a tubular spacer is positioned in the cavity to transfer a clamping force from the locking bolt to the adjustment nut.

7. A hinge assembly as claimed in claim 5 or in claim 6 in which a washer interposed between a head of the locking bolt and the flange against which it reacts.

8. A hinge assembly as claimed in any of claims 2 to 7 in which the threadform on the outer surface of the second hinge member is of the opposite hand to the threadform in the threaded bore.

9. A hinge assembly as claimed in claim 8 in which the outer surface of the second hinge member has a left handed threadform thereon for co-operation with a complimentary left-handed thread formed in the adjustment nut and the threaded bore has a right-handed threadform therein for cooperation with a right-handed thread formed on the locking bolt.

10. A hinge assembly as claimed in claim 8 or in claim 9 in which the shank of the nut has a bore through which the lock bolt extends in use and the bore includes one or more drive means used to provide a driveable connection between the locking bolt and the adjustment nut.

11. A hinge assembly as claimed in claim 10 in which the driveable connection is operable to allow the adjustment nut to be rotated relative to the second hinge member during adjustment until a pre-determined torque is reached and then is operable to allow the

locking bolt to rotate relative to the shank of the adjustment nut to allow the locking bolt to secure the second hinge member in its adjusted position.

12. A hinge assembly as claimed in claim 10 or in claim 11 in which the drive means comprises one or more detents which engage with an outer surface of the locking bolt.

13. A hinge assembly as claimed in any of claims 2 to 7 in which the shank of the adjustment nut is provided with a drive means used to facilitate rotation of the adjustment nut during adjustment of the hinge assembly.

14. A hinge assembly as claimed in claim 13 in which the shank of the adjustment nut has a bore in which is formed the drive means.

15. A hinge assembly as claimed in claim 14 in which the drive means is a hexagonal shaped portion of the bore in the shank of the adjustment nut.

16. A hinge assembly as claimed in any of claims 1 to 15 in which the closure member is a door for a motor vehicle.

17. A hinge assembly as claimed in any of claims 1 to 16 in which the closure member is a tailgate for a motor vehicle.

18. A hinge assembly as claimed in any of claims 1 to 17 in which the support structure is a body structure of a motor vehicle.

19. A motor vehicle having at least one hinge assembly as claimed in any of claims 1 to 18.

20. A method of attaching a closure member to a body structure of a motor vehicle the method comprising pivotally connecting a first hinge member to a second hinge member, fastening the first hinge member to the closure member, threadingly

engaging an adjustment nut onto the second hinge member so as to position the nut away from a free end of the second hinge member, engaging a shank of the adjustment nut in a pre-formed clearance aperture, moving the closure member into a desired position corresponding to the correct position of the closure member relative to the body structure, holding the closure member in the desired position, rotating the adjustment nut so as to cause it to engage with part of the body structure, tightening a locking bolt threadingly engaged with the second hinge member so as to clamp the second hinge member to the body structure and releasing the closure member so as to allow it to rotate freely with respect to the body structure.

21. A method as claimed in claim 20 in which the closure member is held in the desired position by an assembly fixture to which it is releasably attached.

22. A method as claimed in claim 20 or in claim 21 in which the step of moving the closure member into a desired position includes locating the shank of the adjustment nut in a specific location within the clearance aperture.

23. A method as claimed in any of claims 20 to 22 in which the adjustment nut is rotated by means of a drive means formed as an integral part thereof until a pre-determined tightening torque is reached.

24. A method as claimed in any of claims 20 to 23 in which the adjustment nut and the locking bolt are provided with opposite handed threadforms and rotating the adjustment nut so as to cause it to engage with part of the body structure is performed automatically as the locking bolt is tightened.

25. A hinge assembly substantially as described herein with reference to the accompanying drawing.

26. A motor vehicle substantially as described herein with reference to the accompanying drawing.

27. A method of attaching a closure member to a body structure of a motor vehicle substantially as described herein with reference to the accompanying drawing.

ABSTRACT (Fig.1)

An adjustable hinge assembly

An hinge assembly providing three dimensional adjustment comprises a first hinge member 13 for attachment to a closure 12 and a second hinge member 15 for attachment to a support structure 11. The position of the second hinge member 15 is adjustable by means of an adjustment nut 16 threadingly engaged with the second hinge member 15. A locking bolt 18 is used to hold the second hinge member 15 in a correctly adjusted position and in a preferred embodiment is used to effect the adjustment of the second hinge member 15.

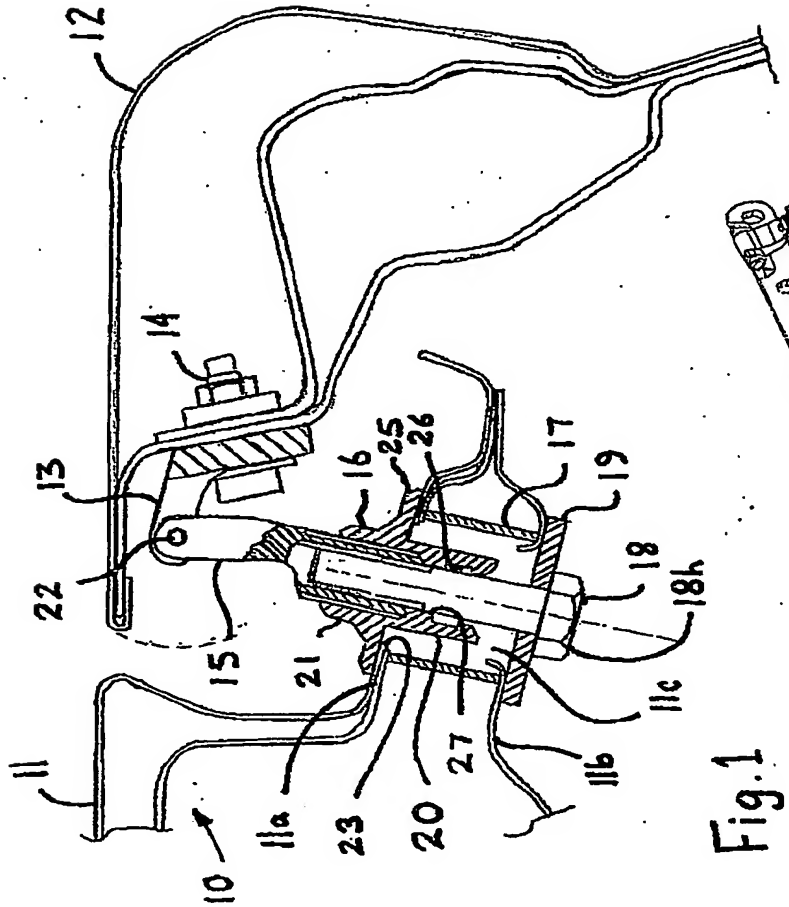

Fig.1

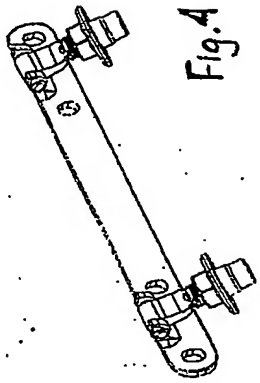

Fig.4

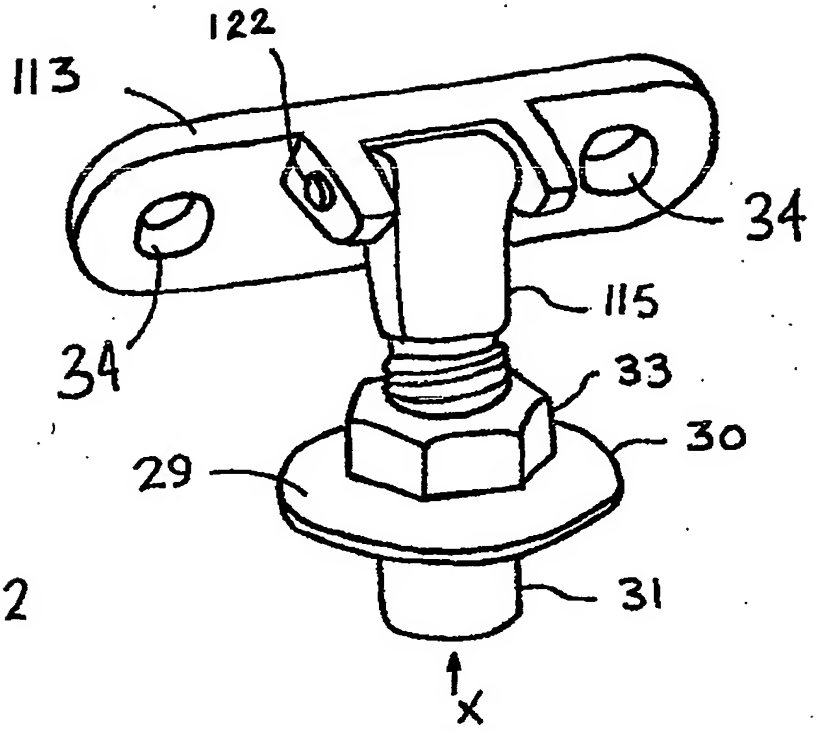

Fig. 2

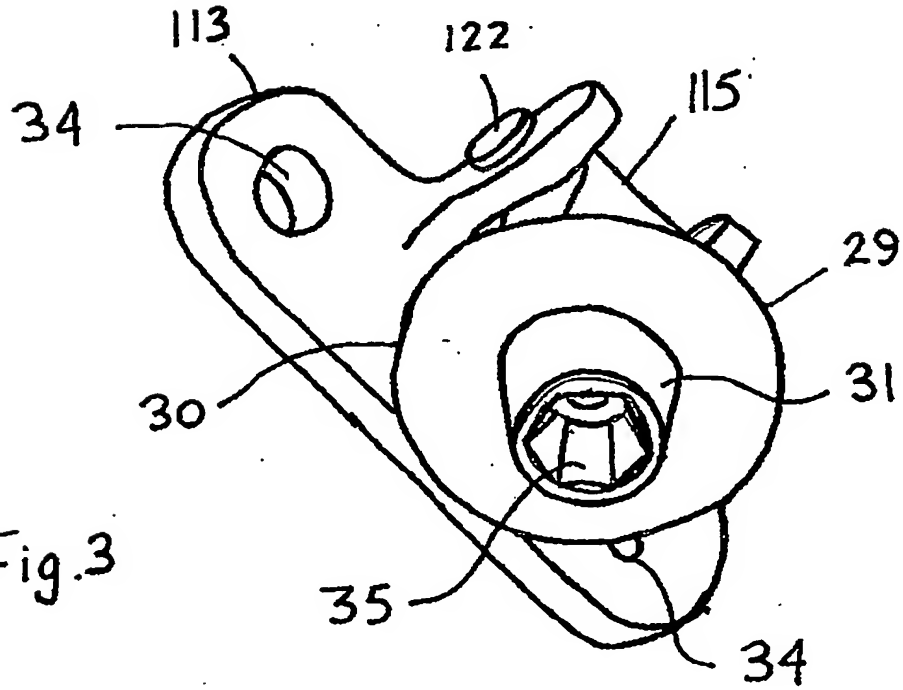

Fig. 3